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# The Implications of Post Disaster Recovery for Affordable Housing

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Jacqueline McIntosh

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## 1. Introduction

Disasters, both natural and man-made and involving the massive destruction of habitats, have been with us since the beginning of time. While responses have varied by countries, depending on their population, wealth and culture; and while the magnitude of disaster has also varied, as does the capacity for a country to respond, each country strives to restore its infrastructure to at least its original state, if not better.

At the same time, affordable housing is also a persistent and world-wide imperative. Common strategies to respond to this need include subsidy, reducing quality, simplification and self-help (Katz et al, 2003; Johnson, 2006; Thorns, 2006; FAS 2008a; Gurran et al, 2008). Subsidy, involving agency payment for part or all of the costs of housing (and seeking to recovery) has been challenged by issues relating to internal objectives and external teaming initiatives (Bratt, 2002, FEMA 2008a). Quality has been compromised by issues relating to longevity, generosity, politics and lack of agreement about the minimum acceptable level of service to be provided (Anderson et al, 2003; FEMA 2008b, Lindberg et al, 2010). Simplification refers to the stripping of any superfluous details such as decoration, outdoor spaces and methods of construction and delivery. Self-help refers to the potential for self-building and in some cases self-financing (Harris, 1999; Brede-noord and van Lindert, 2010; HUD, 2007, Leishman, 2012). These policies have been implemented to differing degrees of success, but affordability crisis persists (RAND, 2008b).

The prospect of more frequent and more extreme exceptional weather events, engendered by climate change, further exacerbates the housing affordability crisis. Nowhere is the intersection of these two issues—post disaster recovery and affordable housing—more intense than in the recovery programmes following a disaster such as an extreme weather event. In the face of growing public awareness and concern for global warming and the potential for climate

change, the challenges of post-disaster recovery and affordable housing have been intensified with a resurgence of interest in sustainability and green building (Hamin, 2008; Levine et al, 2007; Hayles, 2010). The new imperative for sustainable construction demands that *any* new housing be able to weather and mitigate damage from future extreme weather events. No longer is it sufficient to simply temporarily house victims of a disaster. Post-disaster recovery goals demand that this be accomplished using community processes and that new structures are better and stronger, will mitigate damage from future events and will be culturally appropriate (Berke et al, 1993; Comerio, 1998; Kennedy et al, 2008). All this must be achieved within the constraint of affordability.

This chapter explores the problem of providing affordable and sustainable housing in the context of a post-disaster recovery both in the short term and in the longer term. It focuses specifically on the sustainable construction strategies adopted by various US government agencies in the aftermath of Hurricane Katrina. It begins with a description of the response to the hurricane and the unexpected new housing issues that it created. The chapter then explores the sometimes conflicting mandates of federal and state housing providers as well as the providers of affordable housing within the context of a 'sustainability aware' design community. Finally, it identifies some of the broader implications that can be drawn from this case study.

## 2. Hurricane Katrina and the housing market

Hurricane Katrina devastated the US Gulf Coast in August 2005, inflicting major damage on housing, commercial property and infrastructure (Elliott and Pais, 2006; Nigg et al, 2006; Popkin, et al, 2006; FAS, 2008b). While the US has had longstanding experience coping with hurricanes, Hurricane Katrina was the first to impact the central urban area of a major city. Prior to Katrina, the housing stock in the New Orleans region consisted of a mix of single-family dwellings, multi-dwelling units and mobile homes (Nigg et al, 2006). The majority of these were owner-occupied. Most rental housing was privately owned (as opposed to state-owned) and consisted of both single-family homes and multi-unit dwellings purposely built for rental.

During the hurricane, as could be expected, poorly constructed housing sustained greater damage than did housing of better construction (Elliott and Pais, 2006). It was common to find that lower-income families inhabited the more poorly constructed housing (Peacock et al, 2007). Rental housing was generally more poorly constructed than owner-occupied housing. Despite the widespread extent of the damages to housing stock throughout the region, there were significant differences in the extent and intensity of damage among submarkets (Johnson, 2006). The most severely affected subset was the multifamily rental submarket—almost 80 percent of such units were damaged, and one-third of all multifamily rental units suffered severe or moderate damage. About one-half of the single-family residences (owned and rented) suffered damage, and almost 20 percent of all single-family units were severely or moderately damaged (RAND, 2008a).

Following the hurricane, there was a significant increase in demand for affordable rental housing. While the US had typically relied on market forces to supply the bulk of its rental housing requirements, in this instance, the market did not respond as expected (Popkin, et al, 2006). Instead of rushing to rebuild rental housing, many private investors delayed or indefinitely deferred the decision to rebuild. This is evident in the rates of recovery by housing type (Katz, 2008). The rate of recovery moved more rapidly for single-family dwellings than for multifamily units and it was higher for moderately damaged buildings than for severely damaged units. It was also especially true for most severely damaged properties of uninsured and underinsured homeowners and landlords (for example those with multi-unit rental properties). Landlords with severely damaged buildings faced with “overheated” construction costs and financing shortfalls had the ability to “take their investment money elsewhere,” delaying rebuilding until the market cooled off. This was deemed to have been particularly true for the ‘mom and pop’ landlords who depend heavily on the cash flow from rents (Gulf Renewal, 2007 McCarthy, K and Hanson M, 2008).

In addition to those homeowners seeking to restore their housing, some homeowners were not happy with the directions that their former neighbourhoods were taking in the rebuilding process, so they took the cash from their insurance to rebuild elsewhere, often out of state (Johnson, 2006). As a result, the number of private landlords dropped significantly following the hurricane, the proportion of renters relative to owners increased, the demand for affordable housing increased (also inflated by the influx of low-paid construction workers—many of whom were migrants) and the ‘market’ showed signs of not recovering fast enough to meet demand, putting added pressure on the state to provide affordable housing—fast (Gulf Renewal 2007, Quarantelli, E. 1995).

## 2.1. Federal emergency management response to Hurricane Katrina

Shortly after Hurricane Katrina struck, the Federal Emergency Management Agency (FEMA, 2008b) provided temporary emergency housing, drawing from their existing inventory of temporary trailers and the purchase of 102,000 additional travel trailers. The FEMA trailers were a mix of new and used small trailers (18.5 m<sup>2</sup>), larger travel trailers (37 m<sup>2</sup>), and even larger mobile homes (see Figure 1).

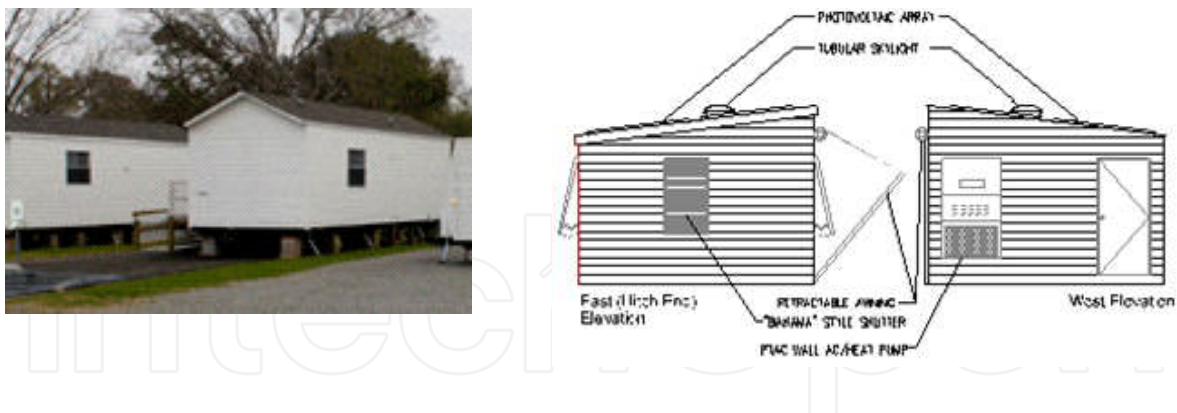


**Figure 1.** FEMA travel trailer types

Designed for mobility and rapid deployment, the trailers were provided on wheels for ease of movement into trailer parks or onto individual lots. To meet the massive demand, the

new trailers were manufactured using the least expensive and most readily available materials and methods, then constructed in haste with little time spent drying out in the factory. This was to backfire later when trailers were found to not only be unsustainable due to their relative expense and short life expectancy, but that they were unhealthy for the occupants (Popkin, et al, 2006).

In addition to the trailers, FEMA had also ordered 25,000 Building America Structural Insulated Panel (BASIP) homes (see Figures 2 and 3). The program for the house design was developed in the 1970s and, like the travel trailers they were designed for temporary shelter, for periods that do not exceed 18 months (Thomas-Rees, 2006). These houses differ from travel trailers both in terms of size and construction. Seeking a more sustainable housing option, the proposed BASIP house design uses prefabricated insulated panels for walls and the roof, resulting in greater energy efficiency and improved durability. Each unit has 3 bedrooms and 2 bathrooms and have been designed for expansion through the joining of a second unit to create a 'double wide.' Other proposed features included special shutters to provide future hurricane protection and solar shading, a retractable awning for solar shading and an additional square area.



**Figure 2.** BASIP Homes

Some of the other sustainable features include the potential for integration of photovoltaics to meet power needs in situations where utilities have not been restored or during times when service is interrupted (Thomas-Rees, 2006). In terms of external appearance however, BASIP's homes look very much like a larger version of the FEMA trailer only with a pitched roof.



Overall, the FEMA travel trailers were widely criticized for providing less than desirable temporary housing (Majority Staff Report, 2008). The Internet is filled with personal accounts of unhappy occupants, reports of unhealthy living conditions and overall dissatisfaction. Although the travel trailers were never intended to be used long term (i.e. their use was limited to 18 months), the extended use of travel trailers following disasters of this nature was common in the southern US, with people continuing to live in them for many years. As of mid-August 2007—two years after the hurricane, 60,000 people were still living in ‘temporary’ shelter FEMA trailers in Louisiana and Mississippi (Blueprint for Gulf Renewal)

## 2.2. State response to loss of housing

While the federal government focussed its efforts on the provision of emergency shelter, the state governments response tended to look further into the future in search of a more holistic and sustainable housing approach that took in the entire urban community (Hassett and Handley, 2006). It became readily apparent to Governor of Mississippi, Hayley Barbour, and his advisors that the so-called temporary shelters had, by necessity, become more permanent fixtures. With their interest in affordable housing models, state officials wanted to go beyond the Band-Aid solutions previously employed for disaster recovery and introduce a more sustainable solution (Peacock et al, 2007). This prompted the governor to employ New Urbanist planner Andres Duany to explore other possibilities. Duany has argued that that shelter is not enough, that a sustainable model had to be fast, flexible and able to transition from temporary shelter to temporary housing and on to permanent housing (Evans-Cowley, 2009). Only through this capacity to transition would costs stay reasonable. Moreover, Peacock et al



**Figure 3.** BASIPS park in LaPlace, St John Parish, LA.

(2007) point out that the capacity of an individual family household to recover is inextricably tied to housing recovery.

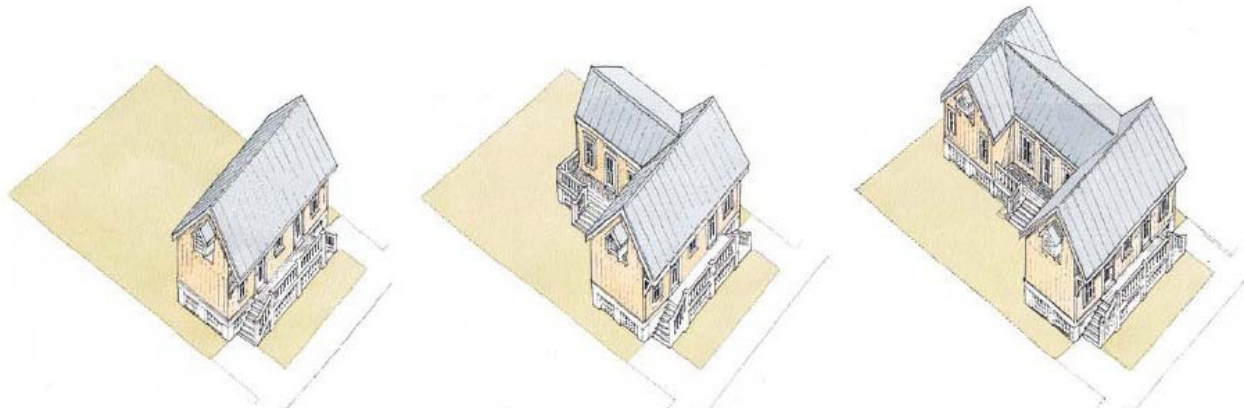


**Figure 4.** The original Katrina Cottage

The houses envisaged by Duany and his partner and wife, Elizabeth Plater-Zyberk, were developed as temporary shelter which could be located in new green-field sites, or at the rear of existing properties, as in-fill properties on vacant pockets of land or could even provide additional dwelling spaces for guests or aging relatives. Initial affordability was achieved largely through their small size. Challenging a group of architects to find an alternative to the FEMA trailer, Duany found what he was looking for in a cottage designed by architect Marianne Cusato (see Figure 4). Her house became known as the 'Katrina cottage', named after the hurricane that prompted its inception. Seeking an intermediate size somewhere between the 18.5 m<sup>2</sup> and 27.8 m<sup>2</sup> FEMA trailers, the first cottage was designed at 27.8 m<sup>2</sup>. The cottages were kitset, using prefabricated panels specially designed for hurricane conditions and able to withstand high wind-load conditions and excessive moisture without incurring damage or destruction. In sum, to meet with new objectives, the cottages had to be sustainable, to be able to mitigate damage from future storms, to be appropriate to regional conditions, culture and climate and deliverable by all major delivery methods. This vision extended beyond simple

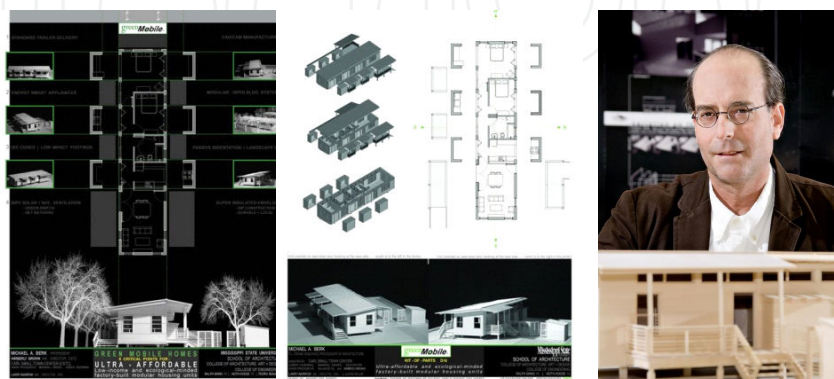
cottage design to an all encompassing community design, avoiding the less than desirable temporary community plans formerly employed (Talen, 2008; Evans-Cowley, 2009).

Other designers continued to build on Duany and Plater-Zyberk's ideas, expanding the original Katrina cottage idea to 20 different cottage models, including the Kernel House, which was designed to grow from an initial 46.4 m<sup>2</sup> module to a 120.7 m<sup>2</sup> home with added wings (See Figure 5).



**Figure 5.** Kernel cottages designed for expansion

These projects attempted to create sustainable post-disaster recovery housing, but one of the more sustainable and interesting is the Green Mobile Project (see Figure 6), which 'represents a blend of key emergency housing needs with energy efficient and affordable housing that can serve as a temporary or permanent dwelling--emphasizing innovative site design features, green building technologies, durability, expandability with an open interior design that can be adapted to varied family needs. The units, therefore, result in 'reduced energy consumption and affordable living' (United States Government Accountability Office Washington, DC 2007, FEMA website).



**Figure 6.** MSU architecture professor Michael Berk shows a model of GreenMobile.



### 2.3. Post-disaster recovery housing becomes affordable (and desirable)

Meanwhile the prototype Katrina cottage had caught the imagination of designers throughout the southern US, eliciting a host of Katrina copies with varying degrees of sustainable construction. Currently there are dozens of listings on the Internet for Katrina cottages that available for rent (Lane, 2008, Benfield, 2010). They are being used for long-term housing and for uses including vacation homes, granny cottages and home offices (Benfield 2010, Stark, 2006). The trailers arrived on site ready to inhabit, flexible for use in a variety of situations and as temporary dwellings, they did not require building consent. The following quotes from the Internet illustrate the range of uses and locations that the cottages have been deployed, well beyond their intended post-disaster recovery housing based in the New Orleans region.

"The Katrina cottage - with living quarters about the size of a McMansion bathroom - is now appealing to people well beyond the flood plain. Californians want to build one in their backyards to use for rental income to help with the mortgage payment. Modestly paid kayakers in Colorado see it as a way to finally afford a house. Elsewhere, people envision building one so a parent can live nearby." (M Cusato, Katrina cottage designer)

"We have lot sizes that are too small for a... single-family, detached household, so the idea is to bring in these extremely attractive dwellings to provide affordable housing," (City councilor, Connecticut)

'Meanwhile, in the iconic new urbanist resort town of Seaside, Florida, Katrina Cottages are being employed for a small educational facility' (Kaid Benfield)

"A developer in Virginia wants to do some as affordable houses. People see it and realize it's a dignified way to live." (M Cusato)

Driven by the desires of the public, the US had found a desirable housing model suited not only to post-disaster recovery, but to the wider development of sustainable, community-oriented, affordable housing.

## 3. Conclusions and discussion

The Hurricane Katrina experience has graphically shown the critical importance of planning and designing post-disaster recovery housing well before the disaster strikes. This advanced planning and design needs to be conducted at both the level of the individual dwelling as well as the community in which that dwelling will be located. It is also critical that these advanced designs be tested particularly when trialling new technologies and processes (Miller, 2006). It is also vital that leadership for these design initiatives be initiated by both the federal and the state government (Bathurst, et al 2011). Once these are initiated, it is imperative that communities and local businesses become fully engaged in the evolutionary design processes *prior* to the disaster (Popkin, 2006; Cowley-Evans, 2009; Talen, 2008).

In planning and designing post disaster recovery housing, it is important to work backwards, from a sustainable housing model that is suited to the needs of the current rental market, but

adaptable for disaster situations. It is also critical to develop the manufacturing technologies and delivery processes that can be ramped up in large numbers and in short time frames. These are best resolved well before any emergency arises. This is the only way to get beyond the constraints imposed by supply and demand economics.

The experience of the post-disaster recovery period in the US following Hurricane Katrina suggests that it is possible to build sustainably and affordably, but it is difficult (Johnson, 2007). The following lessons regarding sustainability and affordability can be gleaned from the events that took place in the aftermath of Hurricane Katrina:

1. There is no such thing as 'temporary' with respect to housing, post-disaster recovery or otherwise. Sustainable housing is more than a discrete 'product'. It must also be considered as a cultural artefact that has particular meaning for the community within which it is located.
2. Significant cost and waste results from non-cooperation between agencies. Conflicting organisational objectives must be aligned in order to achieve long-term sustainable solutions.
3. Even in the most liberal capitalist society, the government should endeavour to lead the way by providing well-researched advanced design solutions. The government needs to play an important role modelling function in facilitating a desirable outcome that will allow the market to follow.

The convergence of post-disaster recovery and sustainable housing research practices has fortuitously created important new directions and opportunities. While the solutions that were created in response to Hurricane Katrina might be vastly different from those appropriate for Third World countries or other cultural settings, the process for 'getting to sustainable, affordable housing' is more universal in its application. *Any* new housing must, within the confines of what is affordable, be able to weather and mitigate damage from future extreme weather events, be culturally appropriate, and strengthen community structures. This leaves us with only one major remaining challenge: Who is deserving of sustainable affordable housing? One intriguing possibility has been put forward by a Californian architect from one of the oldest architectural firms based in that state:

'One of the problems that I see with it, and I probably shouldn't say this, is that it looks nice. I think the government has a very hard time giving things away to people or underwriting things that go beyond some sort of bureaucratically understood minimal gesture'.

The political reality that this architect alludes to is that a significant proportion of the wealthier sectors of society are resistant and vocal about granting the very poor considerably better housing stock to that prior to what they had (or perceived to be had) prior to the disaster. In a post-disaster recovery situation this political and socio-cultural hurdle is mitigated by a combination of public sympathy to widespread loss and the benchmark of the pre-existing housing. Overall, replacement housing should be of equal or only marginally better 'value' than that which existed before. In the cases of the extreme poor, the homeless, or those without property, establishing these benchmarks seem to pose an insurmountable problem.

## Author details

Jacqueline McIntosh

School of Architecture and Design, Victoria University of Wellington, Wellington, New Zealand

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